



An array of new equipment promises swift aid for soldiers, stronger safeguards for lab workers and brand-new capabilities for the weapons surveillance program.

Science and Technology

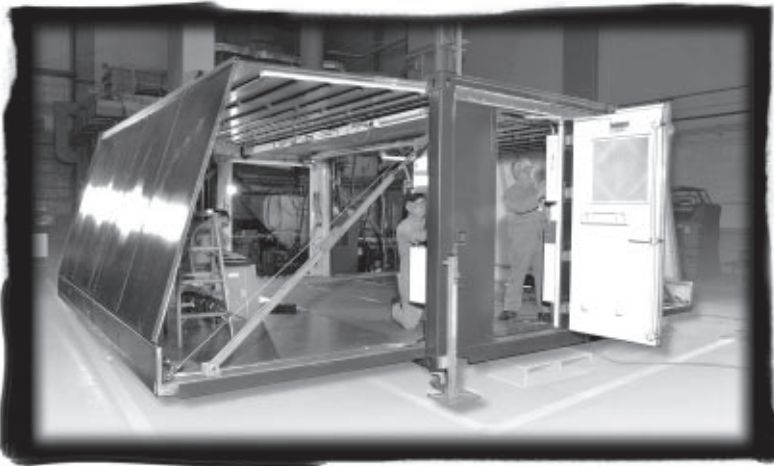
JANICE CHRISTMAN Director, Campaigns

EMERGENCY ROOM: NO WAITING

Soldiers wounded in battle can land on an operating table within minutes, thanks to Y-12's new Future Medical Shelter System. The highly mobile, rapid-setup, 400-ft² surgical suite provides tables, equipment, lights and supplies along with some protection against gunfire and nuclear, biological and chemical contamination. Moreover, the system could potentially morph into a command-and-control center, operations base or similar unit for homeland-defense response actions. Project manager Duane Bias, mechanical engineer Lee Bzorgi (recipient of two patents for the system), and electrical engineer Terry Brown directed the shelter's \$7 million design and fabrication for the U.S. Army.

RESEARCHERS SWAP NEWS, BROADEN VIEWS

Mass spectral analysis, environmental exposure, X-ray fluorescence gauging and uranium oxide film measurement were hot topics in nine Y-12 conference papers at LLNL last November. At the 25th DOE Conference on Aging, Compatibility and Stockpile Stewardship,



Saving lives in battle zones depends on speed. Swift treatment offers even the most severely injured combatants a better chance of returning home to their families.

experts from across the NWC compared notes and coordinated their research in stockpile reliability. "This type of information exchange is very beneficial in keeping the facilities

focused on complementary goals," said Dale Conatser of Engineering. His presentation summarized anomalies identified during routine surveillance evaluations.

Vincent Lamberti of Technology Development coordinated Y-12's participation, numbering 22 employees. Attendee Valerie Newman of Campaigns concluded, "Interacting with folks from other sites, I get ideas on how to improve what Y-12 is doing."



The Enhanced Surveillance Campaign deployed the improved gas sampling cart to support Y-12's Stockpile Surveillance mission.

NOT YOUR GRANDMOTHER'S GLOVEBOX

The new Disassembly Glovebox Facility looks as if it were designed for an enormous alien with 12 arms and a lot of work to do. No 12-armed aliens can operate this equipment, but it is designed to do a lot of work and to keep the Y-12 humans who work with it safe.

The recently installed glovebox will make it possible to increase the rate of disassembly of weapon parts to meet the guidelines of strategic arms limitation treaties while protecting workers from hazardous materials.

Campaigns and Directed Stockpile Work Technology Development/Deployment			
Campaigns (expense funded activities)	Oct-Dec 2003 costed (\$K)	Jan-Mar 2004 costed (\$K)	TOTAL costed (\$K) to date
Enhanced Surveillance Campaign	743	880	1,623
Advanced Design and Production Technologies	1,813	2,217	4,030
Stockpile Readiness Campaign	2,872	3,229	6,101
Dynamic Materials Properties Campaign	605	791	1,396
Advanced Simulation and Computing Campaign	330	202	532
Pit Manufacturing Support	22	43	65
Plant Directed Research, Development and Demonstration	1,510	2,072	3,582
DSW Production Support*	25,214	30,133	55,347
TOTAL costed to date	33,109	39,567	72,676
*DSW's role in Technology Development/Deployment consists of identifying needs, performing operational readiness reviews, providing program-specific training and executing program-specific maintenance of equipment and processes.			

TIME BOMB: AGING EFFECTS ON STORED WEAPONS?

What effect does aging have on weapon materials and components? Y-12 is a key participant in DOE's ongoing surveillance program that analyzes that very question.

Scientists must be able to predict the behavior of weapon systems as they age. To better support its surveillance mission, Y-12 recently initiated four new surveillance technologies.

A unique stress-strain microprobe system measures in situ material properties. To satisfy revised surveillance requirements on niobium, X-ray fluorescence measures niobium concentrations. A prototype configuration was demonstrated in 2003. An enhanced low-temperature thermal decomposition vacuum system and oven provide new insight into metal-aging processes.

An improved gas sampling cart (a significant element in the nondestructive laser gas sampling system) monitors important weapon-related gases in real time.

RESEARCHERS GAIN GROUND IN AIR MONITORING

Scientists know that sensitive real-time monitoring can be key to employee safety. Beryllium is particularly hazardous, as inhaling even small amounts of the substance can lead to chronic beryllium disease.

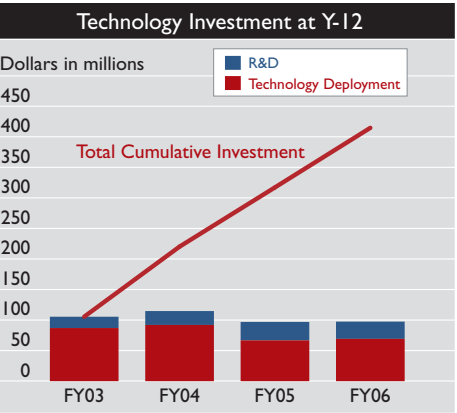
Steve Cristy's recently purchased Aerosol Time-of-Flight Mass Spectrometer determines the size, quantity and chemistry of respirable airborne particles in real time. The instrument has detected beryllium in concentrations four times smaller than the DOE limit of 0.2 µg/m³. The device also can pinpoint substances like uranium, silica and lead.

Robert Smithwick, now at Oak Ridge National Laboratory, and Meng-Dawn Cheng created the Aerosol Beam Focused Laser-Induced Plasma Spectrometer for detecting

Bernard Phifer is working with ORNL to develop a surface-enhanced Raman Spectrometer to detect beryllium oxide in real time. This instrument will be tested for beryllium sensitivity in the near future.

INFLUENCE —Janice Christman

"I am a firm believer in getting fully committed to what you are doing, whether in your job or in any other aspect of your life. When you get committed, all kinds of things come together to create success. A verse from Goethe defines the magic of commitment: 'Whatever you can do, Or dream you can, begin it. Boldness has genius, Power and magic in it.'"



Y-12 will invest more than \$400 million in new manufacturing technology by FY 2006. The Stockpile Readiness Campaign has made capital investments of more than \$13 million thus far in FY 2004.



Y-12 installs a high-speed gantry mill, beefs up digital radiography and helps NASA travel 370 million miles. A new division, Applied Technologies, refines integrated technology planning.

Science and Technology

KEVIN FINNEY Division Manager, Applied Technologies

The Henri Liné gantry mill is only one of many new technologies being deployed at Y-12.



- 5-axis capability (x, y, z, b, and c axes)
- Maximum spindle speed of 16,000 rpm and three interchangeable heads
- Feed rates range from 0.1 to 600 in./min
- Table surface of 29 ft by 16 ft (or 464 ft²)
- Maximum weight of workpiece 120,000 lb
- Computer numerical control
- Part and tool probing capabilities

Y-12 DEPLOYS HIGH-SPEED MACHINING EQUIPMENT

The Y-12 machining initiative recently installed a high-speed 5-axis gantry mill manufactured by Henri Liné. The machine uses three interchangeable heads, linear and rotary

scales, part probing capabilities and a laser tool setter.

High-speed machining increases machine tool productivity. The higher spindle speed and increased depth of cut can increase the

metal removal rate, improve part quality and reduce the time needed to produce parts.

The high-speed mill will manufacture tooling and components, including Navy parts, large-scale monolithic

aircraft components, and parts for energy research. Parts can be “rough” machined to high tolerances before more traditional Y-12 methods are used to finish the part.

ABLE, AGILE AND AFFORDABLE

As more money for new technologies is rolling in, integrated technology planning is helping groups deploy technologies more efficiently to make Y-12 more able, agile and affordable.

The Y-12 Technology Council devised roadmaps providing a vision and route for a thoroughly modern Y-12. A new division, Applied Technologies, is deploying new technologies through a refined process whereby an idea quickly transforms into a tangible product.

Y-12’s Business Development Council identifies partnerships that will secure emerging technologies. Capabilities assessments and other complex-wide activities continue to unveil opportunities and strengthen Y-12’s integrated technology planning efforts.

Y-12 IS A LEADER IN DIGITAL RADIOGRAPHY

Some Y-12 researchers plan to beef up Y-12’s digital radiography until it brings film to its knees. As leaders in the evolution from film-based to digital radiography in the NWC, they’re steadily molding digital radiography into a superstar.

High-energy digital radiography is already used to automate part setup and alignment. A mid-energy digital capability should be available by 2005, and a low-energy digital capability is planned for 2007.

Digital radiography reduces the setup and operation-cycle time for obtaining high-quality radiographs and eliminates film and its related processing chemicals. Digital radiography will also eliminate storage and archival costs for legacy radiographic film. The digital option enables NWC partners to collaborate through tele-radiography and permits the use of computed tomography.



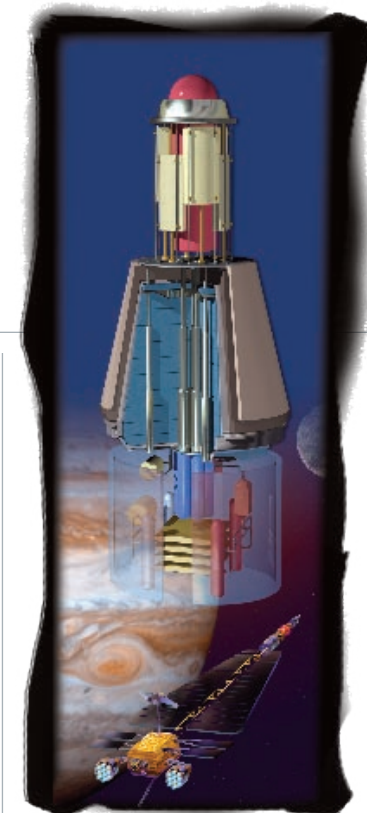
Ed Ripley and Dametria Douglas of Technology Development are currently exploring crucible and insulation materials for microwave metal melting applications—emerging technologies at Y-12.

TO THE MOONS OF JUPITER

If you’re accustomed to hearing “Are we there yet?” after about five miles into a family outing, consider where Y-12’s spacecraft technology is heading. Y-12 engineers are working with the National Aeronautics and Space Administration on the Jupiter Icy Moons Orbiter (JIMO). That particular TripTik covers a 370-million-mile, eight-year journey.

The JIMO mission will explore three of Jupiter’s moons using a small nuclear reactor, generating upwards of 100 kilowatts of electricity, to power the spacecraft’s systems and provide ion thruster propulsion along the way.

Y-12 will help NASA engineer and fabricate the radiation shield for the space reactor. The JIMO shield, which poses complex challenges in every aspect



Y-12 is helping NASA design and build the reactor shield for the JIMO spacecraft.

of development, will protect the orbiter’s science payload and electronics from the intense radiation that the reactor generates.

INFLUENCE
—Kevin Finney

“Think different,” the slogan from an old ad campaign from Apple Computers, depicting Albert Einstein, hangs

on my wall and encapsulates my approach to technology development and application. Traditional thinking won’t get us to our able, agile and affordable objectives.”

